CLAIMS

WE CLAIM:

1. A method for providing positive crankcase ventilation for the crankcase of an engine having one or more reciprocating pistons exposed on a bottom side thereof to the crankcase, whereby the crankcase and bottom side of the one or more reciprocating pistons define a crankcase volume that varies cyclically with reciprocation of the one or more pistons, the method comprising utilizing the cyclically varying volume of the crankcase resulting from reciprocation of the one or more pistons for generating a flow of air through the crankcase.

2. The method of claim 1, further comprising, varying the flow of air through the crankcase substantially in direct proportion to engine speed.

3. The method of claim 1, wherein the engine is a four-stroke engine.

4. The method of claim 1, further comprising:

attaching an inlet control device to the crankcase for allowing a flow of air into the crankcase through the inlet device when the crankcase volume is increasing, and restricting flow out of the crankcase when the crankcase volume is decreasing; and

attaching an outlet control device to the crankcase for allowing a flow of air to escape from the crankcase through the outlet device when the crankcase volume is decreasing, and restricting flow in to the crankcase through the outlet control device when the crankcase volume is increasing.

5. The method of claim 4 further comprising closing both the inlet device and the outlet control devices when the engine is not running, to thereby seal the crankcase volume against the entry or exit of air or other fluids.

6. An apparatus for providing positive crankcase ventilation for the crankcase of an engine having one or more reciprocating pistons exposed on a bottom side thereof to the crankcase, whereby the crankcase and bottom side of the one or more reciprocating pistons define a crankcase volume that varies cyclically with reciprocation of the one or more pistons, the apparatus comprising a crankcase air inlet, a crankcase air outlet, and a control element utilizing the cyclically varying crankcase volume resulting from reciprocation of the one or more pistons for generating a unidirectional flow of air through the crankcase from the crankcase air inlet to the crankcase air outlet .

7. The apparatus of claim 6, wherein the apparatus varies the flow of air through the crankcase substantially in direct proportion to engine speed.

8. The apparatus of claim 6, wherein the engine is a four-stroke engine.

9. The apparatus of claim 6, further comprising:

an inlet control device attached to the crankcase air inlet for allowing a flow of air into the crankcase through the when the crankcase volume is increasing, and restricting flow out of the crankcase when the crankcase volume is decreasing; and

an outlet control device to the crankcase air outlet for allowing a flow of air to escape from the crankcase when the crankcase volume is decreasing, and restricting flow in to the crankcase through the outlet control device when the crankcase volume is increasing.

10. The apparatus of claim 9, wherein both the inlet device and the outlet device seal the crankcase volume against the entry or exit of air or other fluids, when the engine is not running.

11. An engine comprising:

a crankcase and one or more reciprocating pistons exposed on a bottom side thereof to the crankcase, whereby the crankcase and bottom side of the one or more reciprocating pistons define a crankcase volume that varies cyclically with reciprocation of the one or more pistons; and

a positive crankcase ventilation (PCV) apparatus comprising a crankcase air inlet, a crankcase air outlet, and a control element utilizing the cyclically varying crankcase volume resulting from reciprocation of the one or more pistons for generating a unidirectional flow of air through the crankcase from the crankcase air inlet to the crankcase air outlet .

12. The engine of claim 11, wherein the PCV apparatus varies the flow of air through the crankcase substantially in direct proportion to engine speed.

13. The engine of claim 11, wherein the engine is a four-stroke engine.

14. The engine of claim 11, wherein the control element of the PCV apparatus further comprises:

an inlet control device attached to the crankcase air inlet for allowing a flow of air into the crankcase through the when the crankcase volume is increasing, and restricting flow out of the crankcase when the crankcase volume is decreasing; and

an outlet control device to the crankcase air outlet for allowing a flow of air to escape from the crankcase when the crankcase volume is decreasing, and restricting flow in to the crankcase through the outlet control device when the crankcase volume is increasing.

15. The engine of claim 14, wherein both the inlet device and the outlet device seal the crankcase volume against the entry or exit of air or other fluids, when the engine is not running.

16. The engine of claim 15, wherein the engine is a V-twin engine comprising:

a crankshaft mounted in an engine block for rotation about a crankshaft axis;

a pair of cylinders, each defining a cylinder axis orthogonally disposed with respect to the crankshaft axis, the cylinders disposed in a V configuration with respect to one another, with the cylinder axes defining an included angle with respect to one another bisected by a central plane including the crankshaft axis;

a pair of pistons disposed, one in each cylinder, for reciprocating movement in the cylinders along the cylinder axes from a top dead center (TDC) position to a bottom dead center (BDC) position in the cylinders;

a pair of connecting rods, one in each cylinder, for operatively connecting the pistons to the crankshaft such that the pistons will reach TDC and BDC in their respective cylinders at substantially the same time; and

the connecting rods joined at a crankshaft end thereof to the crankshaft by a pair of connecting rod journals centered at a common throw radius from the crankshaft axis and angularly displaced from one another along the throw radius by an angular displacement equal to the included angle of the cylinder axes.

17. The engine of claim 16, wherein the V-twin engine is a four-stroke engine.

18. The engine of claim 17, wherein the pair of cylinders fire alternately on sequential rotations of the crankshaft when the piston in the firing cylinder is approximately at TDC.

19. The engine of claim 16, further comprising:

a crankshaft counterweight attached to the crankshaft for rotation therewith about the crankshaft axis; and

a first balance shaft having a counterweight attached thereto, mounted within the engine block for rotation about a first balance shaft axis, and operatively connected to the crankshaft to be rotated thereby about the first balance shaft axis.

20. The engine of claim 19, wherein the first balance shaft rotates in a direction opposite a direction of rotation of the crankshaft in a one-to-one (1:1) ratio of rotations of the first balance shaft with respect to rotations of the crankshaft.

21. The engine of claim 20, further comprising:

a second balance shaft operatively connected to the crankshaft for rotation about a second balance shaft axis in unison with the first balance shaft in a direction opposite the direction of rotation of the crankshaft in a one-to-one (1:1) ratio of rotations of the second balance shaft with respect to rotations of the crankshaft;

the second balance shaft further comprising a second balance shaft counterweight attached thereto for rotation with the second balance shaft about the second balance shaft axis, in unison with the counterweight of the first balance shaft.

22. The engine of claim 21, wherein the unbalance load is a total unbalance load of the engine, the crankshaft counterweight is sized for counterbalancing one half of the total unbalance load of the engine, and the counterweights on the first and second balance shafts are each sized for counterbalancing one quarter of the total unbalance load of the engine.